STATE LIBRARY OF PENNSYLVANIA
docs,pa PY S416/2.2 W323m
Waste materials utilization :
0 0001 00151565 7

STATE LIB.
OF PA.

W 323m
Pts. 1-2, 1979

Digitized by the Internet Archive
in 2017 with funding from
This project is made possible by a grant from the Institute of Museum and Library Services as administered by the Pennsylvania Department of Education through the Office of Commonwealth Libraries

https://archive.org/details/wastematerialsut00penn

DOCUMENTS SECTION

WASTE MATERIALS UTILIZATION

PY 5416/2.2
W323m
c.1

A PLAN FOR PENNSYLVANIA

PART I

Executive Summary Report and Recommendations

To: GOVERNOR DICK THORNBURGH

From: The GOVERNOR'S SCIENCE ADVISORY COMMITTEE

COMMONWEALTH OF PENNSYLVANIA
Dick Thornburgh, Governor

DEPARTMENT OF COMMERCE
James F. Bodine, Secretary

January, 1979

This report (Part I) contains the Executive Summary Report and Recommendations of the Governor's Science Advisory Committee's technical task force on waste materials utilization. A companion report (Part II) contains the five technical task forces deliberations and recommendations.

GOVERNOR'S SCIENCE ADVISORY COMMITTEE
COMMONWEALTH OF PENNSYLVANIA

GOVERNOR
Dick Thornburgh
SCIENCE ADVISOR
ROBERT D. LAUGHLIN

MEMBERS

Mr. Benjamin F. Burgess
Presbyterian-University of Pennsylvania Medical Center
Philadelphia
Dr. Francis K. Davis
Drexel University
Philadelphia
Mr. Richard H. Demmy
Roy F. Weston, Incorporated
West Chester
Dr. Daniel J. Elazar
Temple University
Philadelphia
Mr. Charles E. Gallagher
Amsco Equipment Company
Erie
Dr. Herschel E. Griffin
University of Pittsburgh
Pittsburgh
Mr. James E. Hazeltine, Jr.
Armstrong Cork Company
Lancaster
Dr. Thomas D. Larson
Pennsylvania State University
University Park
Mr. Robert M. Lauman
Bell Telephone Company of Pennsylvania
Philadelphia
Dr. I. M. Levitt
Mayor's Science & Technology Advisory Council
Philadelphia
Dr. Alexander Lewis
Gulf Oil Foundation
Pittsburgh
Mr. Roger D. Ley
GPU Service Corporation
Reading
Dr. Joseph F. Libsch
Lehigh University
Bethlehem
Dr. Francis J. Michelini
Commission for Independent Colleges & Universities
Harrisburg
Dr. N. J. Palladino
Pennsylvania State University
University Park
Dr. Ruth Patrick
Academy of Natural Sciences
Philadelphia
Dr. Heinz Pfeiffer
Pennsylvania Power & Light Company
Allentown
Dr. Richard H. Pratt
University of Pittsburgh
Pittsburgh
Dr. Paul M. Pitts, Jr.
ARCO Chemical Company
Philadelphia
Dr. Rustum Roy
Pennsylvania State University
University Park
Mr. John H. Schmid
Zurn Industries
Erie
Dr. Raymond L. Wilkins
Rohm & Haas Company
Bristol

Dear Governor Thornburgh:

The Panel on Waste Materials Utilization of the Governor's Science Advisory Committee (GSAC) is pleased to submit to you its report "Waste Materials Utilization - A Plan for Pennsylvania". The Committee's function is to bring specific, articulated analyses of major issues and opportunities to the attention of the executive branch of the government.

In this report GSAC concentrates on the application of technology to help solve two pressing problems: energy and the disposal of municipal solid wastes. Recommendations for a specific system concept are made which appear to be most appropriate for Pennsylvania.

Sincerely,

Robert D. Laughlin

Robert D. Laughlin
Governor's Science Advisor

RDL:rw

03-53-816-2

Bureau of Science and Technology • Department of Commerce • South Office Building • Harrisburg, Penna. 17120 • 717/787-4147

CONTENTS

		Page
I.	SUMMARY OF FINDINGS	1
	A. Introduction	1
	B. The Problem	1
	C. Recommendations	3
	D. The Rationale	4
	E. Background	5
II.	CONCLUSIONS AND RECOMMENDATIONS	7
	A. The Background	7
	B. The Problems and Need - Pennsylvania Perspective	10
	C. General Conclusions and Recommendations	16
	APPENDIX A	
	Table 1 - List of Pertinent Legislation and References	27
	Table 11 - GSAC Panel and Task Force Membership	28
		29
	Acknowledgments	30

I. SUMMARY OF FINDINGS

A. INTRODUCTION

The Governor's Science Advisory Committee, recognizing the complex problems involved in current and future disposal of Pennsylvania's solid wastes, commissioned a panel entitled "Waste Materials Utilization" to investigate and make recommendations for solutions. The broad charge to the panel was to study all aspects: technical, economic, environmental, societal, etc., of the disposal of municipal solid wastes (MSW) while recovering valuable materials.

Total management of municipal solid wastes requires the integration of combined resource recovery and landfill operations, and involves the participation of many public and private entities. This is a complex activity involving difficult to predict variables including social and political implications, and technical and economic uncertainties, our current knowledge of which is based on only modest operating experience. There is a need for full recognition of the interrelationships between various options for energy and resource recovery and sanitary landfill operations, for better definition of the operating variables such as recovered resource product markets, total costs and financing mechanisms, and interactions with existing collection systems, municipal operations and the general public.

B. THE PROBLEM

Existing disposal of waste materials by incineration or landfill, as now practiced by municipalities, represents a major burden to local governments and taxpayers and on Pennsylvania's land, water and air; an unacceptable loss of metals and energy-rich materials. Recognizing this, the

the panel examined and weighed the relative merits of existing and proposed resource recovery technologies. This examination showed that present experiences with advanced technologies and with developmental recovery systems have not proved encouraging from either an equipment maintenance or economic standpoint. Therefore the panel focused on the development of an economical waste materials recovery strategy of wide applicability which would meet the needs of a substantial number of the municipalities of the Commonwealth through a lower risk, well established technology base.

The composition of municipal solid wastes (MSW) is reasonably constant throughout the Commonwealth and contains a high percentage of combustible components. On an as-delivered basis, total combustibles represent about 58%, glass 8%, all metals 8%, moisture 25% and miscellaneous 1%. The heating value of the combustibles is approximately 4,800 Btu/lb. This is a nominal MSW composition and will vary somewhat with location, population mix, etc. The panels judgment was that the least costly and most appropriate technology at this time was to extract only the ferrous fraction of the MSW for reuse and to make a refuse derived fuel (RDF) from the combustibles, all other components being sent to landfill.

C. RECOMMENDATIONS

The Governor's Science Advisory Committee recommends:

- That Pennsylvania arrange, as a Commonwealth Program, the planning, construction and operation of a nominal 200 ton per eight hour day resource recovery plant as a prototype and readily replicated module to produce refuse derived fuel (RDF) and recover ferrous scrap as the primary products.

- That the Commonwealth select a site for this facility that is located near both a State institution with coal-fired boiler facilities to consume the RDF product as a supplement to normal coal supplies, and a population center of at least 100,000 people to provide a source of solid waste feedstock.

- That the Commonwealth arrange for support of the following activities related to the project:

  a) engineering development and economic analysis to optimize use of RDF fuel from the prototype plant in other institutional, industrial and commercial facilities.

  b) maintenance of current awareness of national demonstration activities at the Commonwealth plant.

  c) provision for a reference information service for municipal and elected officials as well as citizen groups to assist in an education effort.

  d) use of the plant as a location to train technical personnel for staffing replicated plants across the Commonwealth.

  e) service as a 'broker' for recovered resource products to be used for recycle applications in industrial production facilities and thus contribute to expanding the markets for recovered products.

D. THE RATIONALE

A 200 ton/day (per 8 hour shift) Waste Materials Recovery Plant is especially suited to Pennsylvania's needs since economies in the collection, transportation, processing, and use of municipal wastes are best served by a Waste Materials Recovery Center of standard size located within (or near) the urban region served, next to a coal-burning facility whose fuel needs are such as to make it a long-term customer for the Recovered Fuel Product(RDF). This size Waste Materials Recovery Plant is large enough to give economies of operation and to provide a match between the quantities of waste produced by a city (or cluster of close-neighbor communities) of 75,000 to 150,000 with the fuel needs of many coal-burning facilities often found in Pennsylvania's urban regions of that size. Thus, the capacity of a single plant lends itself to urban regions of moderate size in which 55% or more of Pennsylvanians live. Since it appears technically feasible to readily scale-up this concept to larger sizes it seems that fewer of these larger plants could serve the other 30% of the states population in larger communities such as Pittsburgh or Philadelphia. The plants operation would focus on recovery and resale of two materials -- iron, steel wastes and energy-rich combustibles, most important to Pennsylvania's industries and most economically separable.

E. BACKGROUND

The concepts behind the GSAC recommendations are as follows:

The potential for recycling of recovered waste materials, either for reuse as materials or as fuels for energy recovery, already exists in Pennsylvania's industries.

The missing ingredient in use of Pennsylvania's waste materials is their recovery for recycling. The Commonwealth's efforts should focus on the development of an economical waste materials recovery strategy of wide applicability.

The recovery of waste materials in sparsely settled regions remote from urban and industrial centers was not examined closely by the GSAC Panel. Since it appears that less than 15% of Pennsylvania's municipal wastes are generated in remote regions representing over 55% of Pennsylvania's area, it may be that at this time land fill represents the most economical, least energy-intensive, approach with the least environmental impact to waste management in rural regions. (Special care must be taken to protect against the degradation of wilderness areas, scenic rivers, etc., however.)

On-going attention to the rapid developments in municipal waste use management, to the special problems of high density large population centers, to rural waste management, and to industrial, agriculture, and toxic wastes is essential. It is intended that a GSAC Panel (or Panels) charged with providing on-going attention will be established.

Costs of handling of wastes and recovered products-of collection and transportation of wastes, and of the recovered products-must be minimized if recovery and recycling of materials is to be economically attractive.

Widespread use of a new technology to replace landfill or incineration of municipal wastes in an economical manner requires:

a) Development of a standard Waste Recovery Plant and testing of its operations designed to provide hard data on its costs and on the best means of operation.

b) Critical analysis of the experience gained in the operation of a pioneering experimental first generation developmental and demonstration model, as well as critical examination of the results of all other experiments and tests of different approaches to waste materials recovery and use in Pennsylvania and elsewhere.

c) A visible, easily-accessible center where local and State elected officials and/or their agency members, staff, or consultants can come for reliable engineering data (and/or an overview of) costs and other aspects of alternate Waste Materials Recovery strategies and technologies.

d) A highly visible and responsible center for training of technicians as needed for replication of Waste Materials Recovery Centers throughout Pennsylvania.

e) Cooperation with industries interested in the manufacture of operation of waste materials recovery equipment, or in the recycling of the recovered product.

II. CONCLUSIONS AND RECOMMENDATIONS

A. THE BACKGROUND

The Pennsylvania Legislature has recognized both the environmental and the resource recovery problems associated with municipal solid waste. Act 241 entitled "Pennsylvania Solid Waste Management Act", (1)* enacted in 1968 (revised 1/70, 8/72) dealt primarily with the environmental planning and regulatory aspects of solid waste disposal and the development of sanitary landfill operations, although reuse of waste materials was included in the Act's objectives. Act 198 entitled "Pennsylvania Solid Waste Resource Recovery Development Act", (2) recognizing municipal solid waste as a potential resource, was passed in 1974. Together these two acts have provided a base for joint planning of effective solid waste management.

The Pennsylvania Department of Environmental Resources (DER) has served as the State agency to administer these Acts, working with local officials to provide information, review and direction. Of special note, market studies have recently been made by DER to determine the amounts and types of waste materials and potential markets.

In 1975, the Joint Legislative Air and Water Pollution Control and Conservation Committee issues a comprehensive review of "Municipal Solid Waste Management" (3) to the General Assembly of the Commonwealth of Pennsylvania, recommending legislation to expedite the shift from landfills to reclamation centers.

In the latter part of 1976, a Pennsylvania Senate Committee, (4) chaired by the Honorable Robert J. Mellow, held hearings on the solid waste 'problem' in the Commonwealth.

*Numbers appearing in parentheses refer to references in Table 1.

Rather more recently, resource recovery as a principal method of solid waste management has received national attention, primarily through EPA. The status of seven projects supported by EPA was described by S. A. Lingle in a recent update entitled "Demonstrating Resource Recovery" (5). Similarly, the National Science Foundation has supported a program at Columbia University dealing with "Resource Recovery Technology for Urban Decision-Makers" (6), and the National Academy of Sciences has issued a Supplementary Report on mineral resources and recovery entitled, "Resource Recovery from Municipal Solid Waste" (7). In addition, the Federal government has recognized the urgent need for action by passing (PL 94-580) the "Resource Conservation and Recovery Act of 1976" (8), amending the 1965 Solid Waste Disposal Act (PL 89-272) and the Resource Recovery Act (PL 91-512) reflecting the growing sophistication of solid waste concerns -- from simple disposal to recycling to conservation.

Except for the most rural parts of Pennsylvania, municipal plans developed pursuant to Act 241, include long range consideration of resource recovery. While some elements of solid waste management are general, i.e. technological processes, environmental concerns, etc., program implementation is highly localized and specific in terms of the individual public entities and private firms involved, the historical and political situation, geography, and population density. Several large urban centers, including Philadelphia and Pittsburgh, have organized local committees to consider the specific concerns for implementation of solid waste management.

The report on "Status of Technology in the Recovery of Resources from Solid Wastes" (9), summarizes the status of many planned and demonstration facilities throughout the country involved with: (a) auxiliary fuel production

systems, (b) energy-recovery/incineration systems, (c) energy-recovery/pyrolysis systems, (d) materials recovery systems, and (e) biological recovery systems with particular concern for emissions control. The Pennsylvania DER has provided an abbreviated summary (10).

Recognizing the localized and specific nature of municipal solid waste management implementation, early in 1976 the Governor's Science Advisory Committee initiated a study panel on Waste Materials Utilization to consider the information available from a Pennsylvania perspective. The Panel limited its considerations to municipal solid wastes, e.g. residential and light industrial, setting aside sewerage sludge, autos, tires, hazardous and chemical wastes. Further, the GSAC Panel addressed the broad-based concerns related to the problem by the establishment of five task forces: (a) logistics and information exchange, (b) technological process, (c) economic considerations, (d) social and political implications and (e) educational efforts. GSAC Panel members and participants on the various task forces are shown in Table II - Waste Materials Utilization Panel - Organization.

The recommendations of the individual task forces support the general recommendations contained in the report.

B. THE PROBLEMS AND NEED - PENNSYLVANIA PERSPECTIVE

Population Distribution - Pennsylvania's population can be distributed into three major groups based on density considerations as they relate to waste disposal operations: (a) the large urban cities - Philadelphia and Pittsburgh - some 25-30%; (b) intermediate population centers of 100,000 - 500,000 such as Harrisburg-York, Lehigh Valley, Erie, Scranton-Wilkes-Barre, comprising some 55%; and (c) small communities representing the remainder of the State's population. Because of extensive rail/highway connections, some smaller communities, i.e., 10,000/25,000, might be connected through transfer stations to 100,000-plus population centers. The problem and needs in Philadelphia and Pittsburgh are unique and should be considered independently. However, the potential for scaling up the system described in this report to the 800 to 1000 ton level is considered feasible. Similarly, small remote communities which cannot be interconnected economically to create population centers of more than 100,000 require separate attention. There exists a strong possibility that the problems and needs of population centers of 100,000-500,000, existing or derived by transportation (some 65%), could be considered in a common manner, utilizing a proven technology, optimized to represent minimum cost, and sufficiently flexible to accomodate local situations involving social and political implications as well as differences in raw waste supply, landfills and markets for resource recovery plant products.

Localized and Specific Variations - Ultimately, municipal solid waste resource recovery operations will be economically viable. Such viability requires at a minimum an assured supply of raw waste, and markets for

resource recovery products. Collection varies with locale and can involve private as well as municipal collection. To some extent the mix of raw waste and thus the corresponding recovery product varies with the population center and the season. Transportation and landfill situations are specific, as are the sensitivities of population to location of resource recovery plants. Local industries may be special product markets.

Funding - The major obstacle in implementing Pennsylvania Act 198 has been the uncertainties associated with large project funding. Decision-makers in the municipalities are confronted with a host of uncertainties, such as (a) economic data pertaining to process cost including as variables the economics of scale, the raw waste supply, the value and potential markets for the products, and cost of capital including inflation; (b) solid waste source data including geographical location of the source, quantity of solid waste produced and hauling cost, considering constraints on the number of trucks, load size and haul distance; (c) the amount of non-saleable output (landfill disposition) from the plant site; (d) as well as limited operating experience data.

The implementation of Act 198 has been difficult because of financial limitations. Initially the interest rate established by law for the loan program was too high to attract municipal acceptance. Later, this was reduced, but not funded. A grant authorization was then added.

State of Technology - Technologies for processing municipal solid waste are at different stages of development. Most rapid implementation and efficient management of solid waste will probably come from optimization of a single technology of modular character which can be replicated at

other population centers with variations to accomodate local situations, e.g. nature of markets or raw waste. Such an approach involving a 200 ton/eight hour day resource recovery plant as a module to produce RDF and recover ferrous materials and to serve 100,000 people appears very appropriate to Pennsylvania in view of the State's coal-intensive position and the potential use of RDF in coal-burning facilities. Concentration on a single system, i.e. an auxiliary fuel production system (RDF), rather than on a variety of more sophisticated technologies, should help in rapidly stabilizing the financial considerations.

Public Information and Understanding - As Project Snowshoe* demonstrated, Pennsylvanians (most probably in common with citizens of other states) are very sensitive to the location for disposal of wastes. There is an urgent need to present the future situation in a total context progressing from waste management (primarily landfills), through recycling (source segregation and collection and resource recovery plants) to conservation (less waste production). A well operated resource recovery plant optimized with respect to operations as well as environmental and aesthetic quality might avoid false images. There is a need to make information and documented results available to several population elements, i.e. the general public, specific local public groups, municipal authorities and elected officials, pressure groups, and investors.

Status of Landfills - Pa. Act 241 (1) requires approved sanitary landfill operations for municipal solid waste and designates DER as the monitoring agency.

*a proposal to transfer sewage sludge from one part of the State to another.

Many new landfills have been established or planned and handling procedures have been improved. However, the practice of sanitary landfill operations, though economical, is often crude, and each operation is highly specific with regard to geology, the potential for generating leachate, and the pollution of aquifers. In addition, suitable sites are progressively more difficult to locate, particularly near high population centers, and within economic transportation radii. These conditions along with general inflation are bound to increase future cost of landfill operations.

Status of Resource Recovery - State financial aid for resource recovery in Pennsylvania was established by Pennsylvania Act 198 in 1974. Grants totaling nearly $2.3 million have been offered to three municipalities for proposed resource recovery demonstration projects. Butler County ($1.023 million), Bridgeport Borough, Montgomery County ($868,125), and the city of Erie ($400,000) are the grantees. Grants to Blair County and to Mifflin County and other solid waste authorities have been made to further resource recovery (RR) projects. These projects cover a wide range of recovery techniques from low technology materials recycling projects to the generation of pipeline-quality methane gas derived from processed solid wastes. The city of Erie project, if carried to completion through additional funding from the Federal Government has some of the elements of the GSAC concept inherent in its structure. Ferrous metal reclamation and a refuse derived fuel are the principal products from the proposed Erie RR system. There is an urgent need for a comprehensive simulation model which can be used in a specific situation to aid decision

makers and for reliable cost data.* This would aid in replication at many locations across the State and would address the financing problems, thus avoiding early financial disasters and redundant costs. In addition, State and local (50-50) contributions, under Act 241, eventually totalling approximately $340,000 are being used for 13 marketing studies to provide guidance for resource recovery planning. Economic and institutional problems, including rapid inflation, have retarded some projects.

Approach to Resource Recovery vs. Other States - Since 1970 more than 20 States have passed one or more laws intended to encourage resource recovery from municipal solid waste. The laws take various forms and provide a variety of financing mechanisms. They range from the establishment of strong "State resource recovery authorities"; to multipurpose public corporations with broad powers; to State environmental agencies with powers usually restricted to authorities; to grant and loan programs which leave the responsibility for construction, operation and ownership at the 'local level'; to resource conservation through waste reduction.

The present Pennsylvania program for resource recovery is based on a grant and loan program with responsibility and ownership remaining at the local/regional level.

Projected Sequence of Municipal Solid Waste Recovery - Currently municipal solid waste disposal in Pennsylvania is based on local landfill operations, increasing costs of landfill operations, decreasing availability of suitable landfill sites, and an increasing concern for land as a resource to be conserved. These facts indicate that resource recovery

*A computer based model to meet the needs has been developed at Lehigh University under sponsorship of the Pennsylvania Science and Engineering Foundation

must play a rapidly increasing role in a time frame which for population centers of 100,000 to 500,000, is short. Longer time is available in truly rural areas, while Philadelphia and Pittsburgh have already initiated their development work.

C. GENERAL RECOMMENDATIONS AND CONCLUSIONS

Recommendation No. 1

The Commonwealth should undertake full responsibility for the construction and operation of a 200 ton per 8 hour day resource recovery plant close to a major State institution and located in a region serving a minimum of 100,000 people. The plant should be modular for easy replication, produce a refuse derived fuel (RDF) as the primary product and be designed for ferrous metal separation. Such a plant would (in no particular hierarchical order):

- -- permit early experience with the value of resources recovered from solid wastes thus minimizing the institutional barriers that derive from technical, marketing and financial uncertainties; municipal decisions; risk allocation; etc.
- -- place primary emphasis on energy recovery, the recovery product of greatest potential value in municipal solid waste
- -- provide for ferrous metal recovery and recycling, using existing secondary materials networks for distribution
- -- be a facility to provide technical, economic and institutional data and experience to facilitate replication at other locations in the Commonwealth
- -- permit optimization in operation of the module
- -- represent a minimum size module for economic viability, yet capable of serving large segments of Pennsylvania population by replication
- -- be flexible relative to scale-up or parallel operation of two processing lines to expand production, if desired

-- permit experience and experiment with potential problems of (A) interaction with private interest, (B) product markets, (C) the resource recovery-landfill balance, (D) production and maintenance uncertainties, (E) air emission and other environmental evaluations and (F) public understanding and acceptance.

-- provide a low sulfur fuel source for blending with Pennsylvania coal

-- be of a size compatible with the fuel needs of State and/or private energy using facilities and variously sized electric utilities, thus increasing the marketability of RDF fuel

-- be in consonance with national, State and regional goals for conservation of energy and materials

Rationale

Smaller resource recovery plants minimize transportation - the highest cost element in the disposition of solid municipal waste. While some operating economies may be associated with large-scale plants, i.e. 1000-1500 tons/day, a smaller plant provides greater flexibility in distribution of the RDF fuel, i.e. to State and private institutions, with greater flexibility and a potentially better price structure. Modular plants should be easily replicated and minimize learning redundancy. 200 ton/eight hour day plants are adaptable to large segments of Pennsylvania's population. Finally, such a prototype plant and program would be planned and implemented as a Commonwealth Project in its entirety, is preferable to 'competitive grantsmanship' by a number of municipalities, and hopefully perceived as a state-wide benefit as opposed to a benefit provided to a given region.

Recommendation No. 2

In conjunction with the proposed resource recovery facility the State should additionally provide for and manage the following related activities:

-- engineering experimentation to optimize use of the RDF fuel product in various private and State coal-burning plants

-- maintenance of current awareness of national demonstration activities, in addition to experimental activities at the proposed plant

-- provision of a reference information center for municipal and elected officials as well as citizen groups to assist in a major public understanding effort

-- a location for training technical personnel for staffing of replicated plants across the Commonwealth as they are established

-- a 'broker' for resource recovery products to be used in experimentation by industrial production facilities and thus contribute to expanding the markets for recovered products

In contrast to the construction of the prototype plant, these ancillary activities should remain the direct responsibility of the Commonwealth and should not be delegated to a contractor. Further, since such functions are essentially extensions of the existing DER Solid Waste Management Program, responsibility should be assigned accordingly.

Rationale

Since reliable information pertaining to many of the uncertain elements involved in the decision to proceed with a resource recovery plant will be developed in the proposed facility, it would appear quite likely that municipalities would have a basis for proceeding with their own replications with sufficient confidence to attract financing much in the manner now used for sewer and water type municipal services. In this sense, the

recommended support for auxiliary activities to be centered at the proposed plant is essential. The facility recommended would not be just another plant, but a means to develop an optimal facility in an organized and well planned manner, including analysis, experimentation and a center for knowledge transfer, for eventual replication across the Commonwealth. Current awareness of other technologies could also provide organized evaluation of such technologies using the 200 ton/8 hour day RDF module as a base. Such new technologies could be add-ons to the 200 ton/8 hour day plant when the technology is considered economically proven for Pennsylvania.

Recommendation No. 3

The recommended plant program, in addition to developing experience with relevant technology, should demonstrate optimal approaches to overall planning, determining environmental impact, and developing public discussion and state-local relationships. This should include (A) providing systematic review of the environmental and economic impact of resource recovery facilities including the consideration of incurred costs and any dislocations resulting from construction and operation; (B) assessing the effects of establishing resource recovery facilities on existing/planned landfill operations including encouragement and stimulation of private sector participation in combined resource recovery-landfill complexes; and (C) assuring special efforts to design and locate structures and transportation facilities in ways that reduce aesthetic landscape and related intrusions.

Rationale

Success of the recommended resource module program and, even more

importantly, successful replication of such modules across the Commonwealth requires full consideration of societal, institutional and aesthetic factors. The recommended facility must exhibit acceptable aesthetic as well as functional and economical features to gain public acceptance. It must be demonstrated that integration of resource recovery operations into the community can be accomplished without undue hardships, dislocations and disruptions of existing community patterns. Planning of facilities should include consideration of maximum private sector participation in all functions including landfill for process residues.

Recommendation No. 4

To facilitate planning and organization of programs to replicate the recommended modules across the Commonwealth, DER should prepare an implementation kit incorporating information such as the following:

-- Planning guide covering the official and public steps leading to the formation of regional resource recovery operations

-- Description of and instructions for using the econometric model developed by the Economic Task Force of the GSAC Materials Utilization Panel

-- Model ordinances for segregation of demolition and bulky wastes, white goods (refrigerators, stoves, washing machines), heavy ferrous metals (engine blocks, auto wheels, structural steel) from the municipal solid waste stream that is to be processed by resource recovery facilities.

-- Model intermunicipal agreements

-- Model energy/materials sales agreements

-- Model contracts for facility design, construction, and start-up

Rationale

The purpose of this package would be to describe and provide for local officials and public interest groups the procedures and types of documents that would be used in a typical Pennsylvania area when a resource recovery plant is undertaken. The "model" ordinances should authorize public ownership of solid wastes and provide for adoption of inter-municipal agreements and/or joining an area-wide authority. The package should be prepared with the view of maximizing State and Federal funding benefits, as well as recognized regulatory requirements.

Recommendation No. 5

A formal 'structure' should be established to 'manage' the program, implement the recommendations, give continuing review and supervision, and maintain current awareness of emerging technologies. It is recommended that DER - specifically the Resource Administration Office - serve to implement the construction and operating program and provide continuing evaluation. It is important that the two components of DER - the one for construction and operation of the prototype facility, and the other for state-wide local planning and technical assistance - work in harmony.

In addition, it is recommended that GSAC establish a continuing Waste Materials Utilization Panel to help plan and advise DER in connection with the prototype resource recovery facility and the proposed ancillary activities; and to provide a liaison with the Governor's Solid Waste Committee, the Governor's Energy Council and a Citizens' Advisory Council when it is established; to help monitor the application of the recommendations in the report; and to maintain a continuing awareness and evaluation of emerging technologies

for resource recovery pertaining to municipal solid waste.

Rationale

The next decade will see a change in the mix - landfill vs. resource recovery - emphasizing resource recovery and conservation, rather than landfill. There will be innovations in technology. The present GSAC Panel, cognizant of the primary concerns of municipal solid waste management and knowledgeable in the practical aspects, can help serve to guide the transition. In this respect the on-going GSAC group would serve as an analog of the Materials Advisory Panel of GSAC. In cooperation with the Governor's Solid Waste Committee, the Governor's Energy Council, and others, it would provide needed impetus and guidance to the Commonwealth's overall energy and environment programs. Because of its past association with solid waste management and resource recovery, it is essential that DER be responsible for the implementation of the activities recommended.

Recommendation No. 6

Initial cost estimates for the program, front-end construction costs and ancillary activities approximate $5/6,000,000 in current dollars. It is recommended that the support for the initial program consider (a) Federal demonstration funds related to Public Law 94-580, (b) a small surcharge collected in conjunction with the tipping charge at Pennsylvania landfill operations and (c) a grant from the Commonwealth. Financing for replicated plants whether publicly or privately owned and/or operated is recommended through a public local/regional authority involving municipal tax-free revenue bonds.

Rationale

The new Federal law provides help for the states to initiate solid waste-

resource recovery programs. The surcharge would provide an all-State participation element to the program - the surcharge can be very small - and all of the State's citizens should benefit. A grant from the Commonwealth, particularly for some of the associated activities at the operating plant, should ultimately save the costs of learning redundancy and financing of replicated plants in an environment of less uncertainty.

Recommendation No. 7

The State should extend present efforts of DER to establish a Solid Waste and Resource Recovery Information Exchange at the earliest possible time. The 'Exchange' would act as a central clearing house to receive, file and reference, and disseminate national, State and demonstration plant information to appropriate groups. In fulfilling this responsibility DER should make use of available PENNTAP (Pennsylvania Technical Assistance Program) resources.

In addition, a Governor's Conference on Solid Waste Management and Resource Recovery in Pennsylvania - supported by GSAC - should be planned and scheduled for an early date.

Rationale

Ultimately the Information Exchange and the Governor's Conference will help provide an optimum program in the shortest time and at lowest cost across the State. A central, organized, State source for information exchange and distribution is essential.

Recommendation No. 8

DER should provide assistance to communities in conducting studies relating to municipal solid waste collection, routing, time and motion analysis and source separation. Simultaneously, it is recommended that studies be initiated to optimize collection vehicle design and raw waste handling.

Rationale

The high cost of collection and transportation indicates that considerable economies could be developed by guidance from centralized planning and experience. Optimal collection and discharge vehicles will play a more important role in resource recovery than in landfill operations.

Recommendation No. 9

At the earliest possible date Pennsylvania Acts #241 and #198 should be amended to represent the current comprehensive approach to solid waste management (landfills) - resource recovery - conservation; in particular, to provide the financial arrangements for funding of the proposed prototype facility and the recommended auxiliary activities.

Rationale

The information to be provided by the proposed resource facility and its auxiliary activities (Recommendations No. 1 and No. 2) should minimize the need for State financed loans by establishing a firm base for public and/or private financing.

Recommendation No. 10

A complementary study should be initiated by GSAC on special wastes utilization involving

-- automobile tires

-- lubrication oils

-- hazardous matter - chemical, biological, toxic metals, etc.

Rationale

The present study was deliberately directed at municipal solid wastes (including commercial and light industrial). It has become apparent that special wastes represent a valuable resource, and hazardous wastes represent a unique environmental problem. Handling of these very different types of waste

requires a separate and distinct program.

Recommendation No. 11

In addition, the Commonwealth should: (1) continue providing management, technological, market development, organization and planning support to the local governments of the larger metropolitan areas (Philadelphia, Pittsburgh and any other areas that are able to organize programs encompassing 1,000 or more tons per day of solid waste) to assist in implementing programs for these areas; and (2) provide increased assistance to local governments of smaller, remote population centers in determining the economic feasibility of various waste transportation modes and, as they emerge, advanced processing technology concepts.

Rationale

The 200 ton per 8 hour day resource recovery module recommended is most directly applicable to localities with populations in the range of 100,000 to 500,000 people by replication of one or more modules as required to handle the waste generated. Experience throughout this country has illustrated that structuring a resource recovery program is a very complex undertaking even in larger metropolitan areas which have direct control over large quantities of wastes. Developing and carrying out plans for resource recovery involves a wide range of specialized expertise. This type of assistance could be beneficial in bringing these plans of larger metropolitan into reality, especially since the assistance provided would be based on the insight and experience gained in planning and carrying out the recommended 200 ton per 8 hour shift module program.

Within the current understanding of the economies involved, it appears unlikely that the smaller, remote population centers - some 15% to 20% of the

State - could entail the work of specialized expertise not always readily available in these areas and the development of a program involving two or more groups of governmental entities. In addition, the results from the 200 ton per 8 hour day module program, particularly the efforts associated with maintaining awareness of emerging processing technologies, will be of direct benefit to these smaller, remote localities.

APPENDIX A

Table 1 - List of Pertinent Legislation and References

(1) Pa. Act 241 - Solid Waste Management - August, 1968 (1/70, 8/72)

(2) Pa. Act 198 - Resource Recovery - July, 1974 (10/75)

(3) Report to General Assembly (Pa.) - Municipal Solid Waste Management Joint Legislative Air & Water Pollution Control and Conservation Committee, January, 1975.

(4) Senator Mellow's Committee - Late summer - fall 1976

(5) "Demonstrating Resource Recovery" - edited by S. A. Lingle, Waste Age Age, June, 1976, pp 19.

(6) "Resource Recovery Technology for Urban Decision Makers" by H. J. Schultz als., Urban Technology Center, Columbia University, January, 1976.

(7) Mineral Resources and the Environment - Supplementary Report: Resource Recovery from Municipal Solid Wastes, National Academy of Sciences, Washington, D. C. 1975

(8) U. S. Public Law 94-580 - Resource Conservation and Recovery Act of 1976 - October 21, 1976.

(9) "Status of Technology in Recovery of Resources from Solid Wastes: by J. D. Parkhurst, Los Angeles County, California (1976)

(10) Technical Manual for Pennsylvania Solid Waste - Resource Recovery Development Act - Pennsylvania Department of Environmental Resources (1975)

(11) Report: "Resource Recovery Activities in Other States" by T. Bratton, DER (Pa.) 1976.

APPENDIX A

TABLE II (B)

GSAC WASTE MATERIALS UTILIZATION PANEL

Task Force Members

LOGISTICS

J. Hazeltine (Chairman)
Armstrong Cork Company

T. Bratton
Gordian Associates Incorporated

I. Levitt
Mayor's Science & Technology Adv. Council

D. Meyer
Vulcan Materials

TECHNOLOGY

R. Swoyer (Chairman)
Pa. Power & Light Company

J. Schmid
Zurn Industries

J. Manson
Lehigh University

E. Clymer, Jr.
Philadelphia Electric Company

R. Coughlin
Lehigh University

W. Bucciarelli
Pa. Department of Environmental Resources

M. Rutkowski
U.G.I.

F. Temmel (retired)
Bethlehem Steel Company

L. Wenzel
Lehigh University

H. I. Hollander
Gilbert Associates

ECONOMIC CONSIDERATIONS

A. Smigel (Chairman)
Public Utility Commission

R. Carson
Gilbert Associates

J. McNamara
Lehigh University

T. Saini
Bloomsburg State College

SOCIAL & POLITICAL IMPLICATIONS

R. Demmy (Chairman)
Roy F. Weston, Inc.

R. Herrenkohl, Co-Chairman
Lehigh University

A. Lewis
Consultant Gulf Oil Corp. & Foundation

W. Gilbertson
Pa. Dept. of Environmental Resources

R. Urian
President, Nucom Communications

J. Whetzel
Western Pa. Conservancy

EDUCATION EFFORTS

J. Libsch (Chairman)
Lehigh University

P. Duncan
Joint Legislative Conservation Committee

H.L. Marlow
Pennsylvania State University

D. Hermanson
Urban Observatory Program
Lehigh University

APPENDIX A

TABLE II (A)

GSAC WASTE MATERIALS UTILIZATION PANEL

Panel Members

J. F. Libsch, CHAIRMAN
Vice President - Research
Lehigh University

R. Carson, VICE CHAIRMAN
Department Manager for Technology
Planning & Analysis
Gilbert Associates

R. Demmy
Executive Vice President
Roy F. Weston, Inc.

W. Gilbertson
Special Assistant for Planning
Pennsylvania Department of
Environmental Resources

J. Hazeltine
Vice President & Director of
Research
Armstrong Cork Company

I. Levitt
Director
Philadelphia Mayor's Science &
Technology Advisory Council

A. Lewis, Jr.
Consultant, Gulf Oil Corporation &
Gulf Oil Foundation

J. Schmid
Vice President
Zurn Industries

A. Smigel
Executive Assistant to Commissioner
Carter
Public Utility Commission

F. Temmel
Retired
Bethlehem Steel Company

PENNSYLVANIA STATE LIBR
DOCUMENTS SECTION

WASTE MATERIALS UTILIZATION

S416/2.2
323m
.2

A PLAN FOR PENNSYLVANIA

PART II

Task Force Reports and Recommendations

To: GOVERNOR DICK THORNBURGH

From: The GOVERNOR'S SCIENCE ADVISORY COMMITTEE

COMMONWEALTH OF PENNSYLVANIA
Dick Thornburgh, Governor

DEPARTMENT OF COMMERCE
James F. Bodine, Secretary

January 1979

This report (Part II) contains the five Governor's Science Advisory Committee's technical task force deliberatons and recommendations on waste materials utilization. A companion report (Part I) contains the executive summary report, general recommendations and conclusions.

TABLE OF CONTENTS

		PAGE
I.	INTRODUCTION	1
II.	TASK FORCE RECOMMENDATIONS	2
	A. Logistics and Information Exchange Task Force	2
	B. Technology Task Force	8
	C. Economic Considerations Task Force	13
	D. Social and Political Implications Task Force	17
	E. Education Efforts Task Force	23
III.	TABLES AND ACKNOWLEDGMENTS	27
	A. Table 1 - References and Legislation	27
	B. Table 2 - Panel and Task Force Members	28
	C. Acknowledgments	30

I. INTRODUCTION

The Governor's Science Advisory Committee (GSAC) has considered the complex problems involved in the utilization of municipal solid wastes (MSW) in Pennsylvania and has advanced a concept for the recovery of the heat content of MSW while reclaiming the ferrous metals. Part 1 of the GSAC report titled "Waste Materials Utilization - A Plan for Pennsylvania" contains an executive summary and general recommendations.

In this volume (Part 2) the Task Forces of the Waste Materials Utilization Panel, (A) Logistics, (B) Technology, (C) Economic Considerations, (D) Social and Political Implications and (E) Education Efforts, consider specific problems and develop recommendations. Their reports are presented on the following pages. In general, they provide the specific recommendations required to implement the concept of a modular, 200 ton/8 hour day resource recovery operation. The two volumes (Part 1 and 2) taken together comprise the GSAC report on "Waste Materials Utilization - A Plan for Pennsylvania".

II. TASK FORCE RECOMMENDATIONS

A. Logistics and Information Exchange Task Force

Municipal solid waste management is a problem in logistics, involving (a) population distribution, (b) transportation, (c) the raw waste stream and (d) the recovery products stream. Residents of the Commonwealth produce some 24,000 tons of solid waste daily, with a nominal composition of:

NOMINAL COMPOSITION OF MSW

Refuse Component	Percentage Dry Basis	Percentage Delivered Basis	Heating Value* (Btu/lb)
Paper	40.0	30.0	7,575
Plastics	4.0	3.0	11,000
Rubber & Leather	2.5	1.9	11,000
Textiles	3.5	2.6	7,650
Wood	2.0	1.5	8,600
Food Wastes	18.00	13.5	8,500
Yard Wastes	8.0	6.0	8,600
Total Combustibles	78.0	58.5	
Glass	10.0	7.5	0
Metals			
Fe	9.3	7.0	0
Al	1.0	0.7	0
Other NFM	0.4	0.3	0
Miscellaneous	1.3	1.0	0
Moisture		25.0	
	100.0	100.0	

This waste must be transported from points of generation to centralized locations to provide adequate concentration for economically viable processing or sanitary landfill. It is estimated that 70% of the cost of municipal solid waste disposal is represented by collection and transportation.

*Chemical Engineer's Handbook, Perry & Chilton Editors, 5th Edition, (McGraw-Hill, New York, 1973),p.9-8

Successful resource recovery depends on a constant raw waste stream that will yield a reasonably predictable quality and guaranteed minimum quantity of recovery products. While some variation in the relative composition of the raw waste stream occurs with the season and the specific locality, the evidence is that such variations are manageable provided the quantity of the raw waste stream is maintained.

The following recommendations pertain to these logistic consideration.

1. Commonwealth Population Distribution

Recommendation No. 1

Development of municipal solid waste recovery systems should proceed simultaneously in areas with three levels of population density, (1) 100,000/500,000 people representing approximately 55% of Pennsylvania population, (2) the two metropolitan centers of Philadelphia and Pittsburgh, representing some 25-30% and (3) the remaining smaller communities. Special attention should be directed to 100,000/500,000 population centers.

Rationale: It appears possible that a single technology may serve 100,000/500,000 population centers (200 ton/day raw waste - 100,000 people). Planning for this population density would have broad implications and avoid learning redundancy. Although variations in potential markets exist from one such center to another, a relatively small size module offers flexibility for use of the primary recovery product, i.e. energy.

Philadelphia and Pittsburgh are unique situations with special opportunities/problems, and localized planning is already underway.

Sanitary landfill operations may continue to be the predominant disposal method for small communities until a technology economically viable for small plants, i.e. 50 tons/day or less, develops.

2. Raw Waste Stream

Recommendation No. 2

Encourage programs with source separation of metals, glass, non-ferrous metals and wastepaper as a means for enhancing the total value recovered from municipal solid waste.

Rationale: Despite the indifferent success to date with source (household, small commercial) separation programs, attempts to develop programs of this type may lead to eventual success with its accompanying enhancement of value recovered from municipal solid waste.

Recommendation No. 3

Develop model ordinances for local adoption to segregate demolition wastes, oversize bulky wastes, white goods (refrigerators, stoves, washing machines) and heavy ferrous metals (such as engine blocks, auto wheels, structural steel) from the municipal solid waste stream that is to be directed to a resource recovery facility.

Rationale: Shredding of heavy ferrous scrap, for example, requires a larger shredder and larger horsepower motor with concomitant increases in foundation costs, ancillary equipment, and operating and maintenance costs. Separate curbside collections or handpicking on the tipping floor of the resource recovery facility are reasonably effective means of removing heavy ferrous material.

3. Transportation

Recommendation No. 4

The Department of Environmental Resources should provide assistance to communities in conducting studies relating to municipal solid waste collection, routing, time and motion analysis and source separation.

Simultaneously, it is recommended that design studies be initiated to optimize raw waste handling and collection vehicles.

Rationale: The high cost of collection and transportation indicates that considerable economies could be developed by guidance from centralized planning and experience. Optimal collection and discharge vehicles will play a more important role in resource recovery vs. landfill operations.

Recommendation No. 5

Trucking appears to be the preferred method for transporting recovered metals.

Rationale: Ferrous Metals recovered after coarse shredding will have a density of approximately 15 lbs/cu ft. Semitrailers of 2,380 cu ft. capacity are readily available which allow net weights in excess of 40,000 lbs. Optimum trucking rates - which are normally competitive with rail rates with an 80,000 lb. minimum - are usually obtained at a 40,000 lb. minimum. In order to obtain the optimum rail rate, a rail car of 5,300 cu ft. capacity would be required. Such rail cars are not generally available. In addition, the scrap purchaser may provide complete trucking services thus eliminating the capital cost of a rail siding.

Recommendation No. 6

General locations for resource recovery plants serving 100,000/500,000

population centers should be determined based on viable transportation radii established from a computer model and other factors.

4. Recovery Products Stream

Recommendation No. 7

Energy recovery in the form of RDF should be a primary objective. Consumed with coal, low-sulfur refuse derived fuel will help to reduce SO_x emissions. Engineering specifications for RDF fuel are required to assist marketing.

Rationale: Pennsylvania is coal intensive and offers good potential for refuse derived fuel projects involving co-firing this fuel with coal.

Recommendation No. 8

Ferrous scrap should be magnetically separated after coarse shredding of the municipal solid waste and prior to secondary shredding for preparation of refuse derived fuel.

Rationale: The magnetic separation of ferrous scrap from municipal solid waste is a relatively straight forward technology with potential for a viable market.

Recommendation No. 9

Means for the recovery of glass, plastics, wastepaper, and nonferrous metals should not normally be included in the design of the prototype operation. However, the separation of glass for the purpose of minimizing maintenance and damage to the shredding and waste handling equipment is desirable. Further knowledge of the carryover of the glass fraction of the RDF product and consequent problems in the utilization of this fuel in boilers is desirable.

Rationale: The current state of the art of technology for the economical recovery of glass, plastics, and nonferrous metals from municipal solid waste is not sufficiently advanced to warrant a major capital investment to achieve this recovery. Feasibility studies are continuing and may eventually provide justification for the investment of additional funds to provide an alternative to landfill disposal of glass and nonferrous metals. This concentrated inorganic fraction should be buried in selected locations of landfills to permit future retrieval when the needs of the economy dictate.

The relatively small success of household point source separation of wastepaper make it preferable to look to this waste for enhancement of the fuel value of municipal solid waste rather than as a fibre where value is historically erratic.

In the case of plastics, the difficulty of material identification makes recovery for reuse a doubtful possibility. Combustion for fuel value appears to be the most viable choice.

Recommendation No. 10

Maximum use should be made of secondary materials outlets in marketing recovery products - including the possibility of detinning.

Rationale: Detinning plants and scrap dealers are located within economical trucking distance of every possible location within the Commonwealth. Furthermore, scrap destined for these markets can be shipped loose and thus eliminate the need for expensive baling equipment necessary to produce baled scrap for the steel industry.

II. B. TECHNOLOGY TASK FORCE

The Technology Task Force has reviewed and evaluated the status and availability of soild waste processing technology (5), (6), (7), (9), (10), for applicability to Commonwealth of Pennsylvania solid waste management operations. Based on this review the following recommendations are made.

Recommendation No. 1

The Commonwealth should undertake responsibility for a 200 ton/8 hour day resource recovery plant as a module to produce densified refuse derived fuel (RDF) as the primary product. This plant should be located contiguous both to:

- A State institution with stoker-fed, coal fired boilers to provide a ready outlet for the RDF as a supplementary fuel, and
- A population center for at least 100,000 people to provide a source of solid waste feedstock for the resource recovery plant.

Rationale: A Commonwealth sponsored program should be limited to applying technologies that have operational histories or have been demonstrated and have the potential for substantial replication throughout Pennsylvania. Densified RDF production was selected as the recommended process on the following bases:

- Composting, although operational (including in Pennsylvania) has a history of difficulty in marketing the product.
- Methane collection is a highly specialized technology requiring unusual conditions in preparing very deep landfills such as is possible in deep canyons in California.

- Steam raising incineration is well proven but, due to the combination of high capital costs and the need for a close-by, long-term market for steam, has been generally limited to locations having populations of 500,000 or more.
- Incineration with waste heat recovery technology has been proven, but although not as capital intensive, generally requires market arrangements as stringent as those for steam raising incineration.
- Two pyrolosis/gasification processes have achieved operational/demonstrated status. The wet bottom process yielding a medium Btu fuel gas, as with steam raising incineration requires population levels of 500,000 or more.

  The wet bottom process yielding a high temperature flue gas requires market arrangements as stringent as those for steam raising incineration.
- Refuse derived fuels in general show promise as a result of relatively low capital costs and flexibility of institutional arrangements. Densified RDF offers important advantages as compared with other RDF options:
  - Due to compactness of form, transportation, storage and material handling operation can be substantially facilitated as compared with other RDF forms.
  - Densified RDF can be used in many stoker-fed, coal fired boilers with minimum boiler site modifications. Coarse and fine shredded, and wet pulped products require substantial modifications to the fuel users facilities for receiving,

storage and utilization of the product. These result in increasing the complexity of institutional arrangements.

- There are a large number of stoker-fired, coal fired boilers in Pennsylvania. A large proportion of the boiler facilities in State institutions are, in fact, potential consumers of this product as a blend with coal.

With an economy of scale which permits consideration of plants with capacities in the range of 200 ton/8 hour day, densified RDF offers the potential for replication in applications to serve 100,000 or more population. In addition to the major metropolitan areas of Philadelphia and Pittsburgh (some 25-30% of the Commonwealth population), this technology has the potential for serving an additional 55% of the population in modest and smaller population centers.

Recommendation No. 2

The Commonwealth should continue to provide management, technological, market development, organization, and financial planning support to the local governments of the larger metropolitan areas (Philadelphia, Pittsburgh and any other areas that are able to organize programs encompassing 1,000 or more tons per day of solid wastes) to assist in implementing resource recovery programs for these areas.

Rationale: Experience throughout this country has illustrated that structturing a resource recovery program is a very complex undertaking which requires a wide range of expertise. Both Philadelphia and Pittsburgh are developing plans for resource recovery. In Philadelphia, for example, current effort is concentrated on developing a program to produce steam from refuse for use in the existing downtown distribution system. The

type of assistance covered in their recommendation could possibly be beneficial in bringing these plans into reality at the earliest possible time.

Recommendation No. 3

The Commonwealth should provide increased assistance to local governments in less populated areas (less than 100,000 people in 30 mile radius) in determining the economic feasibility of various waste transportation concepts.

Rationale: Within the current understanding of the economics involved, it appears unlikely that these smaller population centers - some 15% to 20% of the State could adopt available resource recovery technology on an economically feasible basis. In certain instances, however, there is the possibility that existing transportation resources and transfer stations could be utilized to aggregate the 200 ton/8 hour day required from a combination of several of these centers to a single recovery plant location. The evaluation of these instances could entail the work of specialized expertise not always readily available in these areas and the development of a program involving two or more groups of governmental entities.

Recommendation No. 4

There are technological developments in experimental stages - principally wet bottom pyrolosis/gasification devices - which have the potential for utilizing the energy intrinsic in solid wastes for disposal of sewage sludge. The Commonwealth should follow these developments for possible future application in Pennsylvania when these technologies mature.

Financial support for experimental work in this area of technology appears desirable. Similarly, attention should be directed to the use of relatively small decentralized processing facilities such as controlled air incinerators with heat recovery for small communities.

Rationale: One of the most difficult and costly problems facing municipal waste water treatment operations is that of disposing of sludges. Public opposition and environmental requirements are making landfill disposal methods questionable in some areas. Incineration of these sludges is a very costly process due to relatively high demands for fuel, and certainly there is a concern for the future supply of fuel for this purpose. As a general rule, it would appear that the solid wastes generated in a specific area contain sufficient energy to dispose of the sewage sludges generated in that area. It would appear, therefore, that mature technology to apply the solid waste energy content for sludge disposal could have significant benefit in many Commonwealth localities. In particular, this technology may have special application in small Pennsylvania communities, since there are indications that small units (i.e. 50 tpd) may be economically viable. Proper land disposal is the most cost-effective method in most situations, but alternates are needed where this is not feasible.

II. C. ECONOMIC CONSIDERATIONS TASK FORCE

Many of the uncertainties relating to the viability of resource recovery plants are financial. As the name of the Task Force indicates, our concerns are primarily economic in nature, not fiscal. Nevertheless, fiscal problems are considered.

Capital requirements, revenues, costs and expenses will be spelled out specifically in the econometric model being developed and run, under our direction, at Lehigh University.

The recommendations which follow are economic ones, but they are based on fiscal inputs. Specific numbers will be published when results eventuate from the model.

ASSUMPTIONS

(1) Findings are predicted on available, on-shelf technology.

(2) Recommendations are based not only on a partial solution to the solid waste problem, but also on an approach to help conserve energy and material resources.

(3) Considerations are addressed only to the mid-size solid waste sector.

(4) The goal is to delineate the economic viability of middle-range prototype projects which can be replicated easily.

(5) No attempt is made to eliminate landfills; rather the emphasis is on a way to minimize the demand for them.

(6) If solid waste can be disposed of in sanitary landfills at a few dollars a ton, it may be illogical to recommend recycling.

Recommendation No. 1

Determine the economic viability of the market for RDF and ferrous products.

Rationale: It may be argued that if full consideration were to be given to national defense needs, energy short-fall and environmental benefits, then favorable cost/benefit ratios could be disregarded. However, our judgments are based on economics only.

Markets for refuse derived fuel (RDF) and its products, and ferrous products must be long-term, guaranteed and profitable.

Particular attention should be directed to #1 steel and detinning of cans.

Recommendation No. 2

Develop an expanded econometric model to assist decision makers.

Rationale: By testing alternative scenarios ("What-if" simulations) one can determine, more exactly, the relative effectivess of various options.

An expanded model could serve as an educative tool which would not be too sophisticated or esoteric for the users.

Recommendation No. 3

Restrict the solid waste 'universe' to 200-500 tons per day systems.

Rationale: At an average of 4 lbs. solid waste per day per person, this range will provide for a population from 100,000 (200 tons per eight hour day capability) to 500,000 (1,000 tons per 16 hour day capability). This would take care of our most pressing needs, excepting Philadelphia and Pittsburgh, which are special cases.

Transportation radii rarely should exceed 30 miles (subject to affirmation by model). In consonance with Recommendation No. 3, we can match adequate population and solid waste raw material availability with logistics. Further, good local transportation should be provided for two 60 mile per day trips.

Trucking is the mode of preference, providing greater flexibility.

Recommendation No. 4

Preliminary cost estimates for the program, i.e. frontend construction costs for the prototype plant and ancillary activities approximate $5/6,000,000 (current dollars). Support for the initial program should consider (a) Federal funds related to Public Law 94-580, (b) a small surcharge collected in conjunction with tipping charges at Pennsylvania landfill operations, and (c) a grant from the Commonwealth.

Rationale: The new Federal law provides help for the states to initiate solid waste resource recovery programs. The surcharge would provide an all-state participation element to the program. The surcharge can be very small and all of the State's citizens should benefit. A grant from the Commonwealth, particularly for some of the associated activities at the operating plant, ultimately should save the costs of learning redundancy and financing of replicated plants in an environment of less uncertainty.

Recommendation No. 5

For replicated plants, the organizational structure should be a public-private blend.

Rationale: Regional public authorities can be set up but the collecting and handling should be in private hands by contract. Similarly, planning, engineering construction and operation of the recommended Commonwealth plant should involve major participation of the private sector.

A public authority allows for "off balance sheet financing". Nearly all sub-State units are at the maximum of allowable balance sheet debt; this gets

them off the hook. Financing of municipal sewer and water facilities may provide an appropriate model.

User charges would be paid to the Authority, not to the private contractors. Financial control would be solely in the Authority's hands.

Provision should be made for incentives and/or seed money to the public sector by

- loan guarantees with minimum interest rates - dollars
- implementation grants - dollars
- tax exempt instruments - dollars
- technical assistance - people

Finally, revenue from ferrous and other non-fuel elements of the product stream should be excluded from revenue projections necessary to cover operating costs and amortization, since such revenues are unpredictable and involve wide price variations. In contrast, the revenue from RDF and tipping fees is reasonably predictable. Metals revenues when realized can then be used (a) to accelerate retirement of bonds, (b) to make capital improvements other than normal replacements, (c) to allow rebate of a portion of the tipping fees paid by public and private users of facility, and/or (d) as contributions to the General Fund if the resource recovery facility is operated by a public entity.

II. D. SOCIAL AND POLITICAL IMPLICATIONS TASK FORCE

Institutional/societal constraints are likely to be the key determinants in deciding the number, size, character, and location of new waste recovery facilities in Pennsylvania. While a variety of constraints can be anticipated, their exact form cannot be specifically predicted. Yet, it is possible to suggest several areas of activity where effort can be directed toward facilitating progress toward State, regional, and local implementation of solid waste recovery activities.

A. Activities at the State Level

State level activities aimed at implementation of demonstration program results center around two issues: legislative initiatives and statewide planning.

Recommendation No. 1

The recommended prototype plant, in addition to developing experience with the relevant technology, should illustrate optimal approaches to (a) planning, (b) environmental impact, (c) citizen involvement and (d) State-local relationships; these considerations should be as carefully studied and documented as the technological aspects.

Rationale: Develop a demonstration facility in the fullest sense. Institutional/societal factors represent major concerns in establishing resource recovery plants. Careful analysis, deliberate procedures and good documentation at the prototype plant will facilitate its replication at other localities.

- Development of a method for assessing the social, environmental and economic costs and benefits associated with a community's instituting a solid waste recovery program.

B. Activities at the Local Level

Recommendation No. 4

Develop a mechanism for undertaking at the local levels the functions of planning, legislative coordination, and the establishment of incentives related to solid waste recovery.

Rationale: This aspect of the solid waste recovery program may best be embodied in some form of local or regional solid waste management Authority. Such an Authority could negotiate all agreements to assure continuous flow of raw solid waste, purchase of solid waste products and arrange for financing of the local programs. In particular, it is essential that long-term commitments be developed with private sector elements for use of the RDF fuel.

Recommendation No. 5

Provide a systematic review of the environmental and economic impact of a resource recovery facility and offer special assistance for costs and dislocation resulting from construction and operation.

Rationale: Special consideration of the local hardships created by establishment of a resource recovery facility and modest initial aid will help remove institutional opposition.

Recommendation No. 6

The Pennsylvania local government associations should develop a specific program, in cooperation with the State, to stimulate and encourage municipal and county governments to undertake resource recovery programs and projects as appropriate to their needs.

Rationale: The purpose of this recommendation is to utilize the knowledge and efforts of local government associations in a statewide awareness program. Experience has demonstrated that the process of developing intermunicipal projects, is slow and uncertain. Local official decisions to establish joint operations will often be the key factor in progressing toward resource recovery.

Recommendation No. 7

The State legislature should consider a clarifying amendment to Act 241 relating to mandating the responsibilities of local government in implementing State-approved solid waste management plans prepared by municipal and/or county governments.

Rationale: The purpose of this recommendation is to eliminate legal questions concerning the responsibilities of local governments to follow through with the implementation of locally-developed solid waste management plans, after the plans have been approved by the State.

C. General

Recommendation No. 8

The effects of establishing resource recovery facilities on existing/planned landfill operations should be assessed to achieve coordination and

optimal economic and environmental planning. Locations for resource recovery plants must incorporate nearby landfill capabilities. Private interests should be encouraged and stimulated as has been done in private landfill operations.

Rationale: Total planning is essential. Resource recovery plants will have discard, primarily glass, non-ferrous elements, etc. Such plants will require a disposal landfill. There may be special opportunities to integrate private landfill interests into this 'total plan'.

Recommendation No. 9

Make special efforts to design and locate structures, transportation facilities, etc. in ways that reduce aesthetic landscape and related intrusions. Involve community residents and the prototype plant in this process.

Rationale: Design to provide aesthetic as well as functional effectiveness will assist in acceptance of resource recovery plants.

Recommendation No. 10

Implementation of the proposed concept involving a prototype plant and associated developmental and informational activities should be as compatible as possible with previous DER activities and commitments. The market studies and grants already sponsored by DER must be recognized in terms of the modular plant proposed.

Recommendation No. 11

Implementation of the proposed Program should be a stepwise process involving several decision points for change or continuation. Three phases are visualized: (a) a study phase to detail the proposed plan; (b) a

selection phase involving market information, financing options, evaluation of risks, administration arrangements, technology determinations, operational arrangements and architect/engineer selection; and (c) a procurement phase encompassing the final step in the decision making and administrative processes including preparation of the RFP, evaluation of proposals, negotiation of contract and award, construction inspection and operational agreement.

It is suggested that the Critical Path Method (or modification) be utilized for project management.

II. E. EDUCATION EFFORTS TASK FORCE

Solid waste management and resource recovery includes a significant emotional component involving the environment, social and political implications, and economic uncertainty in a period of financial strain for municipalities. Involved are many different target populations, such as the general public, special public action groups, municipal department heads and elected officials - including decision makers, legislators and potential investors. In addition, technical and operating personnel will be needed in the replication of resource recovery plants.

A substantial educational effort is essential to provide these target populations with as much factual information as possible and with an analysis of the various options available for disposal of the Commonwealth's municipal solid waste.

Recommendation No. 1

The State should extend present efforts of the Department of Environmental Resources to establish a Solid Waste and Resource Recovery Information Exchange to operate in conjunction with the demonstration plant site. The 'exchange' would act as a central clearing house to receive, file and reference and disseminate national, State and demonstration plant information to appropriate target populations by:

- establishing a reference file of -
  - municipal programs and projects
  - activities of State agencies
  - private and university research and development
  - environmental group programs
  - national activities
- maintaining a film library with provisions for distribution

- preparation and distribution of a quarterly State News Letter for current awareness of:
    - activities at the prototype plant
    - national programs
    - materials available at the information exchange

Rationale: Ultimately, information exchange will help provide optimum facilities in the shortest time and at lowest cost across the State. A central, organized State source for information exchange and distribution is essential.

Recommendation No. 2

A liaison committee, i.e. "The Citizens Advisory Council", of concerned public groups with an interest in solid waste management and resource recovery should be established to work in parallel with the GSAC Panel on Waste Materials Utilization for public education. Typical citizen groups would include representatives from such organizations as:

- Pennsylvania Environmental Council
- Federation of Sportsmen's Clubs
- League of Women Voters
- Service Clubs
- Chamber of Commerce
- Pennsylvania League of Cities
- Solid Waste Advisory Committee
- PTA

Rationale: Disposal of solid waste is an emotional issue, particularly relative to the location of landfills and resource recovery plants. There is need for early citizen understanding and knowledge of the "trade-offs" and presentation to the general public by acceptable groups. The Wisconsin experience stressed the urgent nature of early participation of citizen groups.

Recommendation No. 3

The Commonwealth should arrange for development of informational materials, operational results, and national experiments to facilitate understanding of the proposed program and acceptance. The materials would be addressed to various target populations, i.e. (1) consulting engineers, (2) municipal department heads, (3) elected municipal officials, (4) different elements of the general public, and would involve:

- o audio-visual presentations
- o 15 minute films
- o slide talks

Rationale: A major consideration in the smooth implementation of a municipal solid waste management program - particularly as the change in the mix - landfill vs. resource recovery occurs - is education of involved target groups. Availability of "materials" for presentations will facilitate such an educational program. "Interns" associated with the prototype plant in conjunction with concerned public groups might help develop such materials.

Recommendation No. 4

A work-study program of training for professional and/or paraprofessional individuals should be established at the site of the prototype plant. The Task Force believes that the nature of training should not be related to a university degree program. Professional trainees would be B.S. graduates (most probably in M.E. or Chem. Engr.) and would receive specific management and experience training by relation to the plant site. Paraprofessional trainees, i.e. technicians, would receive hands-on training and experience in helping to operate the facility. Trainees would "graduate" to replicated plants to become full-time employees, or to other solid waste related activities. Technical societies may

have special inputs to this activity.

Rationale: Efficient initiation and operation of resource recovery plants will require "trained" individuals. The prototype plant proposed represents an ideal "training" facility - particularly if the plant is to be replicated. During the "training" period such professional or paraprofessional individuals could assist with the information exchange, preparation and dissemination of materials, and with experimentation within the plant and with resource recovery products by assisting industry to convert to use of these products.

Recommendation No. 5

Seminars to communicate with consulting engineers, municipal department needs and elected officials, industrial representatives and community leaders should be initiated for individuals involved in waste processing and utilization to maintain current awareness. Such seminars would provide information transfer; they would not have the character of public hearings. Knowledgeable panels travelling across the Commonwealth, i.e Philadelphia, Lehigh Valley, Pittsburgh, in the mode used by the Materials Advisory Panel (MAP) of GSAC, appear desirable. Short courses (2-5 days) should be directed to specific populations (see Recommendation No. 3).

Recommendation No. 6

Finally as an educational follow-up relating to this report, a Governor's Conference on Solid Waste Management and Resource Reocvery in Pennsylvania - sponsored by GSAC should be planned.

Rationale: Such a conference would provide publicity for the report, give opportunity for additional input and reaction, and establish better understanding of the problem and the proposed Pennsylvania situation.

Table 1 - List of Pertinent Legislation and References

(1) Pa. Act 241 - Solid Waste Management - August, 1968 (1/70, 8/72)

(2) Pa. Act 198 - Resource Recovery - July 1974 (10/75)

(3) Report to General Assembly (Pa.) - Municipal Solid Waste Management Joint Legilsative Air & Water Pollution Control and Conservation Committee, January, 1975.

(4) Senator Mellow's Committee - Late summer - fall 1976

(5) "Demonstrating Resource Recovery" - edited by S.A. Lingle, Waste Age, June 1976, PP 19.

(6) "Resource Recovery Technology for Urban Decision-Makers" by H. J. Schultz als., Urban Technology Center, Columbia University, January, 1976.

(7) Mineral Resources and the Environment - Supplementary Report: Resource Recovery from Municipal Solid Wastes, National Academy of Sciences, Washington, D. C. 1975.

(8) U. S. Public Law 94-580 - Resource Conservation and Recovery Act of 1976 - October 21, 1976.

(9) "Status of Technology in Recovery of Resources from Solid Wastes: by J. D. Parkhurst, Los Angeles County, Cal. (1976).

(10) Technical Manual for Pennsylvania Solid Waste - Resource Recovery Development Act - Pa. DER (1975).

(11) Report: "Resource Recovery Activities in Other States" by T. Bratton, DER (Pa.) 1976.

APPENDIX A

TABLE II (A)

GSAC WASTE MATERIALS UTILIZATION PANEL

Panel Members

J. F. Libsch, CHAIRMAN
Vice President - Research
Lehigh University

R. Carson, VICE CHAIRMAN
Department Manager for Technology
Planning & Analysis
Gilbert Associates

R. Demmy
Executive Vice President
Roy F. Weston, Inc.

W. Gilbertson
Special Assistant for Planning
Pennsylvania Department of
Environmental Resources

J. Hazeltine
Vice President & Director of
Research
Armstrong Cork Company

I. Levitt
Director
Philadelphia Mayor's Science &
Technology Advisory Council

A. Lewis, Jr.
Consultant, Gulf Oil Corporation &
Gulf Oil Foundation

J. Schmid
Vice President
Zurn Industries

A. Smigel
Executive Assistant to Commissioner
Carter
Public Utility Commission

F. Temmel
Retired
Bethlehem Steel Company

APPENDIX A

TABLE II (B)

GSAC WASTE MATERIALS UTILIZATION PANEL

Task Force Members

LOGISTICS

J. Hazeltine (Chairman)
Armstrong Cork Company

T. Bratton
Gordian Associates Incorporated

I. Levitt
Mayor's Science & Technology Adv. Council

D. Meyer
Vulcan Materials

TECHNOLOGY

R. Swoyer (Chairman)
Pa. Power & Light Company

J. Schmid
Zurn Industries

J. Manson
Lehigh University

E. Clymer, Jr.
Philadelphia Electric Company

R. Coughlin
Lehigh University

W. Bucciarelli
Pa. Department of Environmental Resources

M. Rutkowski
U.G.I.

F. Temmel (retired)
Bethlehem Steel Company

L. Wenzel
Lehigh University

H. I. Hollander
Gilbert Associates

ECONOMIC CONSIDERATIONS

A. Smigel (Chairman)
Public Utility Commission

R. Carson
Gilbert Associates

J. McNamara
Lehigh University

T. Saini
Bloomsburg State College

SOCIAL & POLITICAL IMPLICATIONS

R. Demmy (Chairman)
Roy F. Weston, Inc.

R. Herrenkohl, Co-Chairman
Lehigh University

A. Lewis
Consultant Gulf Oil Corp. & Foundation

W. Gilbertson
Pa. Dept. of Environmental Resources

R. Urian
President, Nucom Communications

J. Whetzel
Western Pa. Conservancy

EDUCATION EFFORTS

J. Libsch (Chairman)
Lehigh University

P. Duncan
Joint Legislative Conservation Committee

H.L. Marlow
Pennsylvania State University

D. Hermanson
Urban Observatory Program
Lehigh University

Acknowledgements

The present report represents the combined effort of many Pennsylvania citizens as indicated in Table II. We are grateful to each of these individuals and to their organizations for their contributions.

Special thanks are due to Dr. Maurice Goddard, Secretary of Environmental Resources (Pa.), Mr. Wesley Gilbertson and the technical staff of DER for their cooperation and diligent efforts on behalf of the Panel's work.

6155

WERT
BOOKBINDING
MIDDLETOWN, PA.
JAN. 83
We're Quality Bound